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A COURSE OF STUDY IN NUMBER CONCEPTS TO BE TAUGHT
IN THE ARLINGTON KINDERGARTENS

Submitted by

Lawrence John Mantyla

(B.S. in Ed., Bridgewater State Teachers College)
1930

In partial fulfillment of requirements for
the degree of Master of Education

1948

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TABLE OF CONTENTS

CHAPTER	PAGE
I. SUMMARY OF PREVIOUS RESEARCH.....	2
Introduction.....	2
Research in Whole Number.....	2
II. PLAN OF THE PROGRAM.....	3
ACKNOWLEDGMENTS	
Proposed Path with Number in Kindergarten.....	3
I wish to thank Dr. Helen A. Murphy for her guidance in the development of this program.	15
I also wish to thank all the kindergarten teachers in Arlington for the past three years for their counsel, experimentation, and whole- hearted cooperation in the Kindergarten.....	18
Suggested Activities in Whole Number Con- cepts Could Be Introduced.....	25
BIBLIOGRAPHY.....	25

TABLE OF CONTENTS

CHAPTER	LIST OF TABLES	PAGE
I.	SUMMARY OF PREVIOUS RESEARCH.....	1 .
	Introduction.....	1
	Research in Number Readiness.....	1
II.	PLAN OF THE STUDY.....	8
	Proposed Work with Number in Kindergartens..	9
	Suggested Activities in Which Number Concepts Could Be Introduced.....	13
III.	KINDERGARTEN COURSE OF STUDY IN NUMBER CONCEPTS	19
	Philosophy on Courses of Study in Arithmetic	19
	Suggestions and Comments.....	20
	Work with Number in the Kindergartens.....	22
	Suggested Activities in Which Number Concepts Could Be Introduced.....	23
	BIBLIOGRAPHY.....	28

TABLE OF CONTENTS

PAGE	CHAPTER
1	I. SUMMARY OF PREVIOUS RESEARCH
1	Introduction
1	Research in Mump Recidives
8	PLAN OF THE STUDY
8	Previous work with mump in Kindergarten
12	Previous Activities in Mump Gon-
12	sngle Cases
12	III. KINDERGARTEN COURSE OF STUDY IN NUMBER CONCEPTS
18	Philosophy of courses of study in Arithmetic
20	Simplifications and Omissions
22	Work with mump in the Kindergarten
22	Previous Activities in Mump Gon-
22	sngle Cases
22	BIBLIOGRAPHY

LIST OF TABLES

TABLE	PAGE
SUMMARY OF PREVIOUS RESEARCH	
I. Summary of the Opinions Expressed by Eight Kindergarten Teachers in Proposed Number Concepts.....	11

number concepts which may be developed in the kindergarten in Arlington, Massachusetts. While the kindergarten program does not present formal work in arithmetic, it is hoped that this paper may present some specific goals to be reached.

Research in Number Readiness

When we speak of number readiness or children's ability to learn arithmetic in the kindergarten we discover that not much has been done. However, some good work in this field has been done for grade one. Brownell¹ summarizes this evidence in three ways, "evidence from first grade inventories", "evidence from evaluation by testing", and "evidence derived from control-group experiments".

One of the first studies of arithmetical backgrounds was done by Moore² in 1929. His research covered much of the

¹ G. A. Brownell, "Readiness and the Arithmetic Curriculum," *Elementary School Journal* (January, 1938), 38:366.

² C. L. Moore, "The Mathematical Backgrounds of Young Children," *Journal of Educational Research* (October, 1931), 24:262-264.

LIST OF TABLES

PAGE	TABLE
II	I. Summary of the Operations Experienced by Egypt Kingship seen through Maps Geogps.

CHAPTER I

SUMMARY OF PREVIOUS RESEARCH

Introduction

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When we speak of number readiness or children's ability to learn arithmetic in the kindergarten we discover that not too much has been done. However, some good work in this field has been done for grade one. Brownell¹ summarizes this evidence in three ways, "evidence from first grade inventories, evidence from evaluation by testing, and evidence secured from control-group experiments."

One of the first studies of arithmetical backgrounds was made by Woody² in 1929. His research covered much of the

¹W. A. Brownell, "Readiness and the Arithmetic Curriculum," Elementary School Journal (January, 1938), 38:344.

²Clifford Woody, "The Arithmetical Backgrounds of Young Children," Journal of Educational Research (October, 1931), 24:200-201.

CHAPTER I
SUMMARY OF PREVIOUS RESEARCH

Introduction

The purpose of this paper is to summarize the kindergartens in the United States which may be grouped into three main categories: (1) Kindergarten movement before 1850, (2) Kindergarten movement 1850-1900, (3) Kindergarten movement 1900-1930. The first two groups are discussed in detail in the present paper, while the third group is mentioned only briefly.

Research on Kindergarten Readiness

While a number of papers on kindergarten readiness have been written, the author has been unable to find any which discuss the relationship between the two. The first paper on this subject was written by A. W. A. Brownell in 1888. In this paper, Brownell states that the first step in the development of the child is to learn to control his own body. This is done by the child's own efforts, and the teacher's help is not necessary. The second paper on this subject was written by A. W. A. Brownell in 1891. In this paper, Brownell states that the first step in the development of the child is to learn to control his own body. This is done by the child's own efforts, and the teacher's help is not necessary.

The third paper on this subject was written by A. W. A. Brownell in 1894. In this paper, Brownell states that the first step in the development of the child is to learn to control his own body. This is done by the child's own efforts, and the teacher's help is not necessary.

United States and covered from kindergarten through grade two. He concludes in part that "children possess much ability in the elementary processes of arithmetic even before the time of beginning formal instruction in the subject" and that "the knowledge possessed by children is not limited to counting and adding simple combinations, but includes elementary knowledge of fractions, United States money, units of various types of measurement, and the understanding of the processes demanded in simple verbal problems."

In her study with 266 children from the kindergarten, the first, the second, and the third grades of the Elementary School of the University of Chicago, Polkinghorne¹ reports in part: "It seems reasonable, too, that if primary children learn so much about fractions without systematic instruction of any sort, there can be no question about their ability to learn much more about fractions under direct teaching."

In any curriculum construction the precise determination of the part played by activities in the out-of-school life of the pupils in the first grade is important. Smith² lists her findings on the use of arithmetic as "Transactions carried on in stores 30%; games involving counting 18%; reading Roman numerals on clock 14%; reading Arabic numerals in finding

¹Ada R. Polkinghorne, "Young Children and Fractions," *Childhood Education* (May, 1935), 11:358.

²Nila B. Smith, "An Investigation of the Uses of Arithmetic in the Out-of-School Life of First Grade Children," *Elementary School Journal* (April, 1924), 24:621-626.

pages in books 13%; dividing food with playmates and pets (fractions) 6%; depositing money in and drawing money from toy banks 5%; playing store 3%. These seven make up 83% of the entire list." In conclusion she says "there is great probability that they results approximate very closely the true facts concerning the general types of arithmetical experiences which first-grade children encounter in their daily out-of-school lives."

Writing on when to begin teaching arithmetic Buckingham¹ feels that,

we are confronted by two pertinent facts; first, that the child upon entering grade one is ready for arithmetic; and secondly, that he is already using it to serve his own purposes and will continue to do so independently of any action taken by the school. If the time to begin is when the child is ready and has use for the subject, then we should begin the teaching of arithmetic as soon as he comes to school.

MacLatchy², reporting on a survey by Mlle. Descoedres, Beckman, and Mlle. Monchamps, summarizes,

all these authorities agree in presenting evidence that simple number facts may be understood by children at an early age that this knowledge steadily increases, and that there are individual variations in the depth of understanding held by different children at each age.

On a test given to 125 children ranging in ages from

¹B. R. Buckingham, "When to Begin the Teaching of Arithmetic," Childhood Education (May, 1935), 11:342-343.

²Josephine MacLatchy, "Number Abilities of First-Grade Children," Childhood Education (May, 1935), 11:346.

36 to 72 months McLaughlin¹ suggests

Growth in number ability at these immature ages within the limits of the study is very gradual and dependent upon many factors. Brightness is one such factor that strongly influences superior ability at each age level. Furthermore, progress is intimately interrelated and dependent upon mastery of more mature methods of dealing with number experience. These more mature methods are evolved as the child gets insight or understanding of the relational factors existing between numbers.

What do we know about number readiness, about children's ability to learn arithmetic? In a summary of an investigation made by Buckingham and MacLatchy² with 1,356 children, they found:

I. Rote Counting.

In counting by ones about 90 percent of the children succeeded at least as far as 10 and about 60 percent of them at least as far as 20. The typical (median) child counted to 27 to 28. One in eight of the children counted to 100. Half of the children counted by tens at least as far as 40, while one quarter of them counted in this manner to 100.

II. Counting with Objects.

The test used did not require counting of this type beyond 20. The majority of the children (in fact about 60 percent) "broke the test" by counting as far as they were permitted to go. Seventy-five percent counted at least as far as 14.

¹Katherine McLaughlin, "Number Abilities of Pre-School Children," Childhood Education (May, 1935), 11:352-353.

²B. R. Buckingham and J. MacLatchy, "The Number Abilities of Children When They Enter Grade One," The Twenty-Ninth Yearbook, National Society for the Study of Education, Public School Publishing Company, Bloomington, Illinois, Chap. IV, pp. 473-509.

several times in each of which there is a
gradual increase in the number of individuals
and the number of species. This
is followed by a gradual decrease in the
number of individuals and the number of species.
The number of individuals and the number of species
is at a maximum in the middle of the
period, but decreases to a minimum at the
end of the period.

Wetland areas, which are mostly
located in the middle of the period, show
a gradual increase in the number of individuals
and the number of species. This
is followed by a gradual decrease in the
number of individuals and the number of species.
The number of individuals and the number of species
is at a maximum in the middle of the period,
but decreases to a minimum at the
end of the period.

I. Role Computing

In computing the number of species in
the first 10 years, the number of species
is calculated as the sum of the number of
species in each of the first 10 years.
The number of species in each year is
calculated as the sum of the number of
species in each of the first 10 years.
The number of species in each year is
calculated as the sum of the number of
species in each of the first 10 years.
The number of species in each year is
calculated as the sum of the number of
species in each of the first 10 years.

II. Computing with open offices

The first 10 years of the period
is calculated as the sum of the number of
species in each of the first 10 years.
The number of species in each year is
calculated as the sum of the number of
species in each of the first 10 years.
The number of species in each year is
calculated as the sum of the number of
species in each of the first 10 years.

1. Computing with open offices
2. Computing with open offices
3. Computing with open offices
4. Computing with open offices
5. Computing with open offices
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1. Computing with open offices
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8. Computing with open offices
9. Computing with open offices
10. Computing with open offices

III. Reproducing Numbers.

This is one of the writer's two tests of number concepts. Practically all the children "knew" the numbers from 1 to 4. Eighty-five percent of them reproduced 5 at least once out of three trials, and nearly two-thirds of them did so on all three trials. The numbers 6 and 7 were practically equal in difficulty. Fully 80 percent of the children reproduced them once and 55 percent three times. The number 8 was of substantially the same difficulty as the number 10. Over 75 percent of the children reproduced each of these numbers once, and about half of them did so three times.

IV. Naming Numbers.

This is somewhat more difficult as a test of number concepts than reproducing numbers, and the percent of children who succeeded are from 4 to 8 percentage points less. Yet even here the children did well. Forty-two percent of them succeeded every time on the hardest number, namely 10. An additional 28 percent of them showed that they were "on the way" to a reliable understanding of 10 by succeeding either once or twice. Thus a total of 70 percent responded correctly at least once on the hardest number of the series. The corresponding percent for 8 was 72; for 7, 74; for 6, 75; for 5, 81.

V. Combinations in Verbal Problems.

According to the Knight Behrens difficulty rankings, the addition combinations used in this test ranged from 11th to 81st. Some of the children gave correct answers to all the combinations--in fact 91 or 7 percent of them did so. Very nearly half the children got five combinations right and only 11 percent of them failed to get any right. The combinations ranged in difficulty for these children from 5 plus 1 which 71.5 percent of the children answered correctly, to 4 plus 5 which only 22 percent answered correctly.

VI. Combinations with Objects.

The ten addition combinations in this test ranked from 10th to 88th according to rankings of Knight and Behrens. Half of the children answered at least five of these combinations correctly when the objects were concealed. When the objects were visible, more than half the children answered all the combinations correctly. The 88th combination (6 plus 4) was the hardest for the children as was to be expected from its placement on the Knight-Behrens list. Yet this combination was answered correctly by nearly one-third of the children (31.8%) when the objects were concealed and by 40 percent more of them when the objects were uncovered.

Commenting on a similar investigation in the Cleveland Public Schools, Director of Research William L. Connor¹ says:

The amount of number used by little children, as revealed by this test, has proved to be a revelation to all of those connected with the teaching and supervision of little children in the Cleveland Schools. It seems not at all improbable that the fear that school officers seem to have had of crowding number concepts on little children too soon is wholly without foundation in fact.

When one considers the ordinary teaching materials in arithmetic in the light of these findings, fragmentary as they are, it would almost seem as if the course-of-study makers, textbook writers, and teachers of the last generation had conspired to retard by every means possible the natural growth of number concepts which takes place in little children from four to seven years of age.

In answer to the question--Should arithmetic be taught in the kindergarten and in grades one and two?--

¹W. L. Connor, A Study of the Kindergarten Achievement Testing in Arithmetic, Bureau of Educational Research Bulletin No. 6, Board of Education, Cleveland (July 29, 1929).

Sueltz¹ says:

Whether or not the school plans to teach arithmetic in these grades, the children will learn it. Even at the ages of two and three years, normal children are developing ideas of size, amount, and number and are making visual and mental, as well as manual comparisons. Similarly in the kindergarten concepts of size, of shape, of amount and of number are being developed in relation to the things which the children see and handle. These concepts and associations with them precede the stage when it becomes necessary to read and write figures. Opportunities for thinking and for exercise of judgment frequently occur in the kindergarten.

Speaking of the content of the arithmetic curriculum Thiele² points out, "In the strict sense of the word the number learning of five and six year old children cannot be separated from that which is acquired when the ages of seven, eight and nine are reached. Likewise the number knowledge of five and six year olds is a refinement of still earlier ideas regarding quantity."

As research shows, children have certain knowledge of number concepts even before entering the kindergarten, and as this knowledge varies, this paper will present certain concepts which may be developed in the kindergarten.

¹ Ben A. Sueltz, "Curriculum Problems--Grade Placement," Sixteenth Yearbook, The National Council of Teachers of Mathematics, Bureau of Publications, Teachers College, Columbia University, New York, 1941, Chap. III, p. 33.

² C. L. Thiele, "Arithmetic in the Early Grades," Sixteenth Yearbook, The National Council of Teachers of Mathematics, Chap. IV, p. 46.

CHAPTER II

PLAN OF THE STUDY

The kindergarten program was reintroduced into the Arlington public school system in September 1944 after a lapse of several years due to an economy measure.

The writer of this paper became interested in the activities and the purposeful play of the kindergarten with the idea of a planned program for directing, expanding, and extending a number readiness program.

After extensive reading of what research has been done on the subject, an attempt was made to develop a list of concepts which could be introduced during the kindergarten year.

Courses of study available at the Boston University Resources Library and the Boston Public Library and those of the towns and cities having kindergartens in the Metropolitan Boston area were examined.

It was found that in most cases the concept of number was generalized and combined into the area of the kindergarten and the first grade with no specific placement in the kindergarten. However, in some cities and towns, particularly Long Beach, California, San Diego, California,

Akron, Ohio, New York, Boston, Massachusetts, and Philadelphia, Pennsylvania, specific goals are established for the kindergarten. Courses of study in Newton, Massachusetts, Springfield, Massachusetts, Chicago, Illinois, Tulsa, Oklahoma, Los Angeles, California, Belmont and Brookline, Massachusetts were very helpful in this study.

The following list of achievement goals or concepts in quantity, number order, size, location or position, comparison, time, money, weight and measure was compiled from the above sources and presented to the kindergarten teachers of the eight kindergartens in Arlington in the spring of 1945.

Proposed Work with Number in Kindergartens
Achievement goals.

To understand the beginning concepts of number, size, time, measures, and money.

Content

I Quantity

Know meaning of:

Many	Few	In the classroom teacher is asked to check each item
More	Lot	

In the classroom teacher is asked to check each item

Counting concretely 1 to 25 it could be developed.

II Number Order

Know meaning of:

Before	First	Fourth
After	Second	Last
Next	Third	

III Size

Know meaning of:

Great	Whole	Bigger than
Little	Half	Smaller than
Big	Tall	Less

IV Location or position

Know meaning of:

Low	Up	Farthest	Above
Down	Far	Middle	Below
High	Close	Top	Next Near

V Comparison

Know meaning of:

Wider	Closer	Last	Too
Faster	Nearer	Farthest	Bigger
Lighter	Slowly	Late	Most

VI Time

Know meaning of:

Tomorrow	Day	Afternoon	Days of the week
Week	Years	At once	Early
Today	Morning	Minutes	Late
Everyday	Noon	Yesterday	Quiet time (other similar uses)

VII Money

Know meaning of:

Penny	Nickel	Dime	Quarter
-------	--------	------	---------

VIII Weight

Know meaning of:

Heavy	Light
-------	-------

IX Measures

Know meaning of:

Cup	Pint	Quart
-----	------	-------

Each kindergarten teacher was asked to check each item in the list that she had developed or felt could be developed. The results of this investigation are presented in Table I.

Total Concepts.....	72
Unanimous opinion.....	45
Difference of Opinion.....	27
27 Concepts one dissenting opinion	
6 Concepts two dissenting opinions	
4 Concepts three dissenting opinions	

Table I. Summary of the Opinions Expressed by Eight Kindergarten Teachers in Proposed Number Concepts.

Concept	Yes	No	Concept	Yes	No	Concept	Yes	No
Many.....	8	0	High.....	8	0	Week.....	8	0
More.....	8	0	Up.....	8	0	Today.....	8	0
Few.....	8	0	Far.....	7	1	Everyday....	6	2
Lot.....	6	2	Close.....	7	1	Day.....	8	0
Counting....	8	0	Farthest....	7	1	Years.....	6	2
Before.....	8	0	Middle.....	8	0	Morning.....	8	0
After.....	8	0	Top.....	8	0	Noon.....	7	1
Next.....	8	0	Above.....	8	0	Afternoon...	8	0
First.....	8	0	Below.....	8	0	At once.....	7	1
Second.....	8	0	Next.....	8	0	Minutes.....	6	2
Third.....	8	0	Near.....	6	2	Yesterday...	8	0
Fourth.....	8	0	Wider.....	5	3	Day of week.	8	0
Last.....	8	0	Faster.....	8	0	Early.....	8	0
Great.....	5	3	Lighter.....	7	1	Late.....	8	0
Little.....	8	0	Closer.....	7	1	Quiet time..	8	0
Big.....	8	0	Nearer.....	7	1	Penny.....	7	1
Whole.....	8	0	Slowly.....	8	0	Nickel.....	7	1
Half.....	8	0	Last.....	8	0	Dime.....	7	1
Tall.....	8	0	Farthest....	5	3	Quarter.....	7	1
Bigger than.	8	0	Late.....	7	1	Heavy.....	8	0
Smaller than	7	1	Too.....	5	3	Light.....	8	0
Less.....	6	2	Bigger.....	7	1	Cup.....	7	1
Low.....	8	0	Most.....	7	1	Pint.....	6	2
Down.....	8	0	Tomorrow....	8	0	Quart.....	6	2

Total Concepts.....72

Unanimous Opinion.....43

Difference of Opinion.....29

17 Concepts one dissenting opinion

8 Concepts two dissenting opinions

4 Concepts three dissenting opinions

Table I. Summary of the Opinions Presented by Right Wing
Saffron Sectaries in Present War.

Year	No.	Concept	Year	No.	Concept	Year	No.	Concept	Year	No.	Concept
0	8	.....	0	8	.....	0	8	High	0	8	.....
0	5	.....	0	8	.....	0	8	Up	0	8	.....
2	8	.....	1	4	.....	0	8	Far	0	8	.....
0	8	.....	1	7	.....	2	8	Close	0	8	.....
2	8	.....	1	7	.....	0	8	Farthest	0	8	.....
0	8	.....	0	8	Morning	0	8	Midnight	0	8	Believe
1	4	.....	0	8	.....	0	8	Top	0	8	Alleg
0	8	.....	0	8	.....	0	8	Above	0	8	Next
1	4	.....	0	8	.....	0	8	Below	0	8	First
2	8	.....	0	8	.....	0	8	Next	0	8	Second
0	8	.....	2	8	Year	0	8	Year	0	8	Third
0	8	.....	2	8	Day of week	0	8	Midweek	0	8	Fourth
0	8	.....	0	8	.....	0	8	Week	0	8	Fifth
1	4	.....	0	8	.....	0	8	Half	0	8	Sixth
2	8	.....	0	8	.....	0	8	Third	0	8	Seventh
0	8	.....	1	4	.....	1	4	Top	0	8	Eight
0	8	.....	1	4	.....	2	8	Second	0	8	Ninth
1	4	.....	1	4	.....	0	8	Third	0	8	Tenth
2	8	.....	1	4	.....	0	8	Fourth	0	8	Eleventh
0	8	.....	1	4	.....	0	8	Five	0	8	Twelfth
0	8	.....	1	4	.....	0	8	Six	0	8	Thirteenth
1	4	.....	1	4	.....	0	8	Seven	0	8	Fourteenth
2	8	.....	1	4	.....	0	8	Eight	0	8	Fifteenth
0	8	.....	1	4	.....	0	8	Nine	0	8	Sixteenth
1	4	.....	1	4	.....	0	8	Ten	0	8	Seventeenth
2	8	.....	1	4	.....	0	8	Eleven	0	8	Eighteenth
0	8	.....	1	4	.....	0	8	Twelve	0	8	Nineteenth
1	4	.....	1	4	.....	0	8	Thirteen	0	8	Twentieth
2	8	.....	1	4	.....	0	8	Fourteen	0	8	Twenty-first
0	8	.....	0	8	.....	0	8	.....	0	8	Twenty-second
1	4	.....	0	8	.....	0	8	.....	0	8	Twenty-third
2	8	.....	0	8	.....	0	8	.....	0	8	Twenty-fourth
0	8	.....	0	8	.....	0	8	.....	0	8	Twenty-fifth
1	4	.....	0	8	.....	0	8	.....	0	8	Twenty-sixth
2	8	.....	0	8	.....	0	8	.....	0	8	Twenty-seventh
0	8	.....	0	8	.....	0	8	.....	0	8	Twenty-eighth
1	4	.....	0	8	.....	0	8	.....	0	8	Twenty-ninth
2	8	.....	0	8	.....	0	8	.....	0	8	Thirty-first

1. Concepts are classifying opinions
2. Concepts are classifying opinions
3. Concepts are classifying opinions
4. Concepts are classifying opinions
5. Difference of opinion
6. Similarities of opinion
7. Opinions are classifying opinions
8. Opinions are classifying opinions
9. Opinions are classifying opinions
10. Concepts are classifying opinions

In the fall of 1945 a meeting was held of all the kindergarten teachers to discuss the opinions expressed the previous spring and to acquaint the new kindergarten teachers with the whole field of number concepts under consideration. It was decided by the group to carry on a program for a year working on the concepts.

The items where there was not a unanimity of opinion were discussed and it was decided to include them for a trial and meet again in the spring of 1946 to consider the results.

A meeting was held in May of 1946 to discuss whether there were any more items on which all were not agreed. It was found that opportunities had been presented during the year when each item on the suggested list was used. It was decided to use the list as a guide for the school year 1946-1947 and to note the activities in which the introduction of the various concepts were made. A list of these concepts would be forwarded to the writer at the end of the school year.

The following is a list compiled from these reports.

-ranging for it to bleed saw grilleem a 8401 to list off in
 anoliver off necessary snoisig off anolise of anolise per
 off dliw anolise per seperat per wem off dliw anolise of bus grille
 saw fl. poligler consequece wem off grilleem to blett alos
 -now rsey a not macto a no grise of dliw off ad bebeis
 .adgeon off no grise
 noisig to ydlinem a for saw eret off wem off
 list a not mact ebifor off bebeis saw fl bus bebeis off
 .adgeon off rblance of 8401 to grille off in nida teem bus
 perferm anolise of 8401 to ydli off bled saw grilleem A
 fl .beerya for saw fl dliw no eret off ydli off
 off grille off bebeis off need off selfimpergo off bmoi saw
 saw fl .beerya saw fl off bebeis off no mact nose nida
 -now rsey fooda off not ering a as fl off off bebeis
 to noisig off off off dliw off selfimpergo off eret off bus 7401
 adgeon eret off fl A .ebam off adgeon anolise off
 fooda off to bus off to mact off off bebeis off ad blos
 .rsey
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Suggested Activities in Which Number Concepts

Could Be Introduced

Morning Circle:

Different sized chairs

Little children--low chairs

Tall children--high chairs

Quantity

Number of children in the circle

Many--more--few--lot

Teacher and children count children present

Total--girls--boys

Time

Day of the week

What day is tomorrow?

Age of children

Morning--afternoon--noon

Late for school

Responsibilities:

Children give milk and cracker money to teacher on Thursday

Name each coin

Penny--nickel--dime--quarter

Children name coins contributed to Red Cross Fund

Cutting napkins and paper towels for lunch

Halves--possibly quarters

Children mix paste--half cup--full cup

Children pass out milk bottles, straws, crackers, and napkins and paper towels. Number needed--number collected.

Milk distributed in half pints. Comparison with home delivery--pints, quarts.

Games

Looby Loo--right, left, in, out
Turn About--high, low, in, out
The Mulberry Bush--days of the week
The Merry-Go-Round--up, down around
One Big Circle Marching Go--in, out, down, up
Bluebird--through
Musical Chairs--less
Go In and Out the Windows--up, down
Farmer in the Dell--Eight children play
This Old Man--counting
Point Your Little Toe--little
Skip to My Lou--two
Here We Go Around the Mountain Two by Two--two, up
Red Leaves Falling Down--down, over
Oats, Peas, and Beans--middle
Up and Down--up, down
I'm Very, Very Tall--tall, small
Diddle, Diddle Dumpling My Son John--up, down
Snail Game--first, last, nearer, farther
Five Little Chickadees--counting
One Elephant--counting to ten
How Do You Do My Partner?--today
Here We Come Walking Down the Street--today, down
Three Little Maids--three
Little Sally Waters--position
Dance So Merrily--one
As I Was Walking Down the Street--little, down
Ring Toss--number
Knocking at My Door--counting one, third, fourth
Block Relay--first, second, third, fourth
Hide and Go Seek--counting
Riddles--comparison

Biggies-composition
Bridie sang Go back-counting
Brook Rafferty-Litter, saying, I am up
Bring down the door-composing
As I was walking down the street-litter, down
Dense go pretty-one
Bring down the door-composing
Here we come walking down the street-pogay, down
How do you do the person? - together
One person - composing to pen
Lives little misses-mississippi
Sweet game-litter, last, nearer, farther
I'm very, very tall-tall, aussi
Up and down-and, down
Oats, bees, and bees-maggies
Here we do along the mountain two by two, up
Red leaves falling down-down, over
Sight of the two-tow
This big man-composing
Bisner in the Dell-Highway-singing
Go in and out the window-down
Mississiissippi-litter
Bridging-tioning
One big chocolate coloring go-in, out down
The Merri-go-round-down, down among
The waterfalls down to the sea
Two April-may, two in out
Look too-right, left in, out
Same

Songs

Chimney and a Star--far, close
 Two Little Blackbirds--two
 Ten Little Indians--counting
 The Pigs--three, big, today, little
 Three Little Drums--counting
 Here's A Ball For Baby--big
 I Saw Three Ships Sailing--three
 Coasting--down
 The Merry Go Round--up, down
 In the Apple Tree--high
 My Pony--slowly
 The Star and the Moon--little, down, big
 The Milkman--early
 Nickel and Dime--nickel and dime
 Sing Bluebird Sing!--four
 Dandelions--first
 Pussy Willow--early
 Twinkle, Twinkle Little Star--up, above, high
 Snowflakes--little
 Hot Cross Buns--one, two
 Birthday Song--counting
 Big, Tall Indian--size
 Wee Willie Winkie--up, down
 Stairs--up, down
 Rumblekins Are Gay--day, night
 Come Little Leaves--down, one
 Witches--tall, big
 I Haven't A Penny--two, penny, dime
 Elevator Man--up, down, first, second, third, fourth
 O'clock in the Kitchen--little, tall
 The Aeroplane--high, up
 Pretty Bunny--big, long
 Here is Sunshine--high, low
 Robin, Robin Sing to Me--high, up

~~Two and Four were Twins--counting, pairs~~
~~A Penny for Candy--penny~~
~~Two and Six were Twins--counting~~
~~The Clothes of Farmer Jones--size, number, time~~
~~Anybody at Home--size, number~~
~~October Little--counting~~
~~The Story of Juliette--number~~
~~There's My Baby--size~~
~~The Night Before Christmas--number~~
~~Little Dipper--size~~
~~Mother Goose Telle Time--time~~

Songs

Company and a year--let, goes
 Two little Rascals--two
 Ten little Indians--counting
 The pigs--three big, today little
 Three little Farmers--counting
 Here's a A Bell for Baby--big
 I saw Three little Squirrels--three
 Geologists--gown
 The men go round--up gown
 In the Apple tree--up
 The pony--at least
 The star and the moon--little, down, big
 The million--east
 Mexico and Dime--next and dime
 Sixty Builders going--tom
 Dangemons--litter
 Peas--seas
 Twinkie Twinkie little
 Snowflakes--little
 Hot Cross Buns--one, two
 Buttons going--counting
 Big tall Indians--one
 Wee Willie wimpy gown
 Bristles, one, two, three, four
 Rambler's A gay, gay, night
 Some little leaves one
 Whistlers, big
 I have a pony, two, three
 Heavy load now, two, three, four
 O'Clock in the afternoon, tell
 The Aerodrome--bridge
 Peter's Happy--big, long
 Here is a squirrel--high, up
 Robin Robin sing of me--high

The Child's Almanac--size, number
 The Greedy Pig--counting Rhythms

Clapping hands and tapping feet--faster, slowly, lighter
 High Stepping Horses--big, little
 Giant Steps--great, big, little, tall, bigger than
 Skipping--faster, slowly, high, low, down
 Falling Leaves--high, top, up, middle
 Gallop--two by two, before, after
 Jumping--number of jumps
 Walking--number of steps
 Aeroplane--high, low, far, near
 Skating--two by two
 Seesaw--up, down
 Swing--number
 Music--counting rhythm first, second, third, fourth, last
 Dance--counting steps and slides
 Marching--counting soft and loud steps

Three Little Billy Goats--size, number
 Three Little Billy Goats Gruff--size, number
 Stories
 Three Little Pigs--size, number

The Three Bears--great, big, bigger than, smaller than,
 middle
 Three Billy Goats Gruff--big, little
 Three Little Pigs--big, small, little
 Millions of Cats--many
 Pokey Little Puppy--down, up, far, close
 Bobby Had a Nickel--nickel
 I Had a Penny--penny
 Make Way for the Ducklings--counting
 Cinder--number order
 Gingerbread Boy--faster, lighter, nearer
 Ping--today, morning, minutes, early, late
 The Blue Dishes--penny
 The Seven Cats--counting
 Jon and Jean are Six--counting
 Bobbie and Dommie Were Twins--counting, pairs
 A Penny for Candy--penny
 Animated Numbers--counting
 The Animals of Farmer Jones--size, number, time
 Anybody at Home--size, number
 Chicken Little--counting
 The Story of Collette--number
 Where's My Baby?--size
 The Night Before Christmas--number
 Little Hippo--size
 Mother Goose Tells Time--time

The Child's Almanac--day, week
 The Greedy Pig--counting pennies
 The Restless Robin--number order
 The Country Bunny--number or of pages
 The Tale of Easter--time
 The Golden Egg--size
 Peter Rabbit--number
 Little Black Sambo--number
 The Little Gardeners--number, time

Poems

Five Little Squirrels
 Five Little Ducks
 Five Little Bunnies } first, second, third, fourth, last
 Five Little Mice
 Five Little Ants

Here's A Little Ball--little, bigger, big, number
 Here's A Ball for Baby--big
 Tom Thumb--size
 Simple Simon--penny
 When I was One--counting
 Three Wise Men of Gotham--counting
 Choosing Shoes--counting
 The Cat Counting--counting, up, down, high
 A Neat Little Clock--little, time
 The Tall Clock in the Hall--tall
 The Balloon Man--big, small, high, low
 The Barbers--down, close, top
 Rabbits--up, down
 Trains--number
 Foreign Lands--up, down, higher, farther
 The Swing--up, down
 Twenty Foolish Fairies--number

Seatwork

Stringing beads--number, number order
 Peg boards--quantity, number of pegs
 Blocks--size and position
 Paper--number, size, folding for size
 Cutting or use of scissors--size
 Parquetry--form, size
 Plasticine--form, size

With proper construction, suitable content, and wise administration, a course of study can be a directing force and an inspiration to teachers. A truly functional course of study is an achievement in any school system. It should not thwart a teacher's efforts at good judgment.

It is necessary for the teacher to help the children develop clear concepts of elementary arithmetic. The teacher must also realize that effective teaching must be adjusted to the needs of the pupils.

Both pupil and teacher need a clear, unified view of each process, and the teacher should be resourceful in adapting the work to children.

Furthermore there may be much incidental teaching before a process is taken up for systematic mastery, or the incidental work may extend beyond mastery requirements. This is frequently illustrated in a teacher's treatment of fractions. Systematic treatment is scheduled for the sixth grade, and is limited to the few that are useful. However, fractions come easily and naturally into the experience of the child.

Baptismal

standard paper--upper order
by postals--and if necessary
notified on the basis
of this for publication
of baptismal paper--upper
order to the public
Cutting or use of
paper--lower
order

In the kindergarten, in activities throughout the early grades, there may be and should be uses for fractions. The wise teacher capitalizes these uses.

CHAPTER III

KINDERGARTEN COURSE OF STUDY IN NUMBER CONCEPTS

Philosophy on Courses of Study in Arithmetic

With proper construction, suitable content, and wise administration, a course of study can be a directing force and an inspiration to teachers. A truly functional course of study is an achievement in any school system. It should not thwart a teacher's efforts at good judgment.

It is necessary for the teacher to help the children develop clear concepts of elementary arithmetic. The teacher must also realize that effective teaching must be adjusted to the needs of the pupils.

Both pupil and teacher need a clear, unified view of each process, and the teacher should be resourceful in adapting the work to children.

Furthermore there may be much incidental teaching before a process is taken up for systematic mastery, or the incidental work may extend beyond mastery requirements. This is frequently illustrated in a teacher's treatment of fractions. Systematic treatment is scheduled for the sixth grade, and is limited to the few that are useful. However, fractions come easily and naturally into the experience of the child

in the kindergarten. In activities throughout the early grades, there may be and should be uses for fractions. The wise teacher capitalizes on these needs.

The total effect of a simplified, functional program is confidence, success, and a liking for arithmetic. The essentials will be mastered and the child will know where to go for help in little-used processes, without being depressed by impossible requirements for mastery.

Work with Number in the Kindergarten

Since the out-of-school learning has been the outgrowth of the normal, everyday, pleasurable experiences in which number is incidental, it seems reasonable to continue such experiences as a basis for further learning in school. The role of the teacher is to see that the activities in which the child is engaged are of such a nature that he is growing in his ability to cope with his own problems.

The administration of this course of study must necessarily be in the hands of each teacher with full authority to make all adaptions necessary.

Suggestions and Comments

Activities have been selected because of their general value to pupils, not solely because of the opportunity they offer for number concepts.

Kindergarten experience lends itself readily for the introduction of certain concepts of number and this experience should have certain goals in mind.

Children differ in native intelligence, in home instruction, and in opportunities. There is little the teacher can do about differences in native intelligence but she can equalize the amount of instruction and even up the environmental opportunities.

Pupils sometimes gain wrong impressions and begin to acquire habits which are objectionable. They talk about the "littlest" half and the "biggest" half.

While for the child the instruction in number should appear incidental it should be definite in the mind of the teacher.

Pupils will make greater progress with good teaching than without it, even though they may acquire considerable information and skill if left to their own devices.

Comparison				
Know meaning of:				
Wider	Closer	Last	Too	
Faster	Slower	Farthest	Bigger	
Lighter	Heavily	Late	Most	

Comparison				
Know meaning of:				
Tomorrow	Day	Afternoon	Days of the	
Soon	Years	At once	week	
Today	Morning	Minutes	Early	
Everyday	Now	Yesterday	Late	
			Quiet time	
			other similar uses)	

Kungaragatper expefatione feneit leatit tot ppe
 -mexke sind bns tecum to adqesos aqfia to nofemion
 .bnum ai also aqfia ave fayle aqfia
 -aqtant emor ai eanegiffedn evifan ai retit ppe
 nro fadosef ent alftil ai emerT .seftimfroppo ai bns nolt
 nro ent bud eanegiffedn evifan ai aqfia aqfia bns ob
 -aqtivne ent qu neve bns nofemion to dnowe ent exifanpe
 .aftant obponimippe
 of nriged bns aqfia aqfia gnowe nro aqfia
 ent bns nift yent .aftant obponimippe
 .tfer "faeggd" ent bns tfer "faefft"
 bns fadum ai nofemion ent bns tot ppe
 ent to bns ent ai etifiaf ed bns dL fadum
 .nro
 anfosed boog nro aqfia gnowe bns fadum
 aqfia aqfia ent bns fadum
 .aftant obponimippe

Work with Number in the Kindergartens

Achievement goals.

To understand the beginning concepts of number, size, time, measures, and money.

Content

I Quantity

Know meaning of:

Many Few

More Lot

Counting concretely 1 to 25

II Number Order

Know meaning of:

Before First Fourth

After Second Last

Next Third

III Size

Know meaning of:

Great Whole Bigger than

Little Half Smaller than

Big Tall Less

IV Location or position

Know meaning of:

Low Up Farthest Above

Down Far Middle Below

High Close Top Next

Near

V Comparison

Know meaning of:

Wider Closer Last Too

Faster Nearer Farthest Bigger

Lighter Slowly Late Most

VI Time

Know meaning of:

Tomorrow Day Afternoon Days of the

Week Years At once week

Today Morning Minutes Early

Everyday Noon Yesterday Late

Quiet time

(other similar uses)

VII Money

Know meaning of:

Penny Nickel Dime Quarter

VIII Weight

Know meaning of:

Heavy Light

IX Measures

Know meaning of:

Cup Pint Quart

Suggested Activities in Which Number Concepts

Could Be Introduced

Morning Circle:

Different sized chairs

Little children--low chairs

Tall children--high chairs

Quantity

Number of children in the circle

Many--more--few--lot

Teacher and children count children present

Total--girls--boys

Time

Day of the week

What day is tomorrow?

Age of children

Morning--afternoon--noon

Late for school

Responsibilities:

Children give milk and cracker money to teacher on Thursday.

Name each coin.

Penny--nickel--dime--quarter

Children name coins contributed to Red Cross Fund.

Cutting napkins and paper towels for lunch.

Halves--possibly quarters.

Children mix paste--half cup--full cup.

Children pass out milk bottles, straws, crackers, and napkins and paper towels. Number needed--number collected.

Milk distributed in half pints. Comparison with home delivery--pints, quarts.

VII Money
 know measuring of:
 Peru Dine Grafters

 VIII Weight
 know measuring of:
 Peru Hesall

 IX Measures
 know measuring of:
 Peru Graft

 Squeezed Acetinates in Major Number Grafters

 Could be Interrogated

 morning Grafts:

 Difference in size grafts
 little difference--two grafts
 last springen--high grafts

 difficult
 number of grafts in the size
 many--more--less--to
 Toseper any grafters count grafters present
 Total--grits--pots

 time
 Day of the week
 what day is tomorrow
 age of grafters
 morning--afternoon--noon
 late for school

 responses:

 children give with any other money to passers on
 Thursday
 same soap soins
 Peru--Mexico--China--Brazil
 children same soins confectionery to Red Cross Fund
 cutting underlines and paper for stamp
 Haltas--Bosnia
 children mix base--salt--salt and
 children pass out with paper, straw, soap, and
 number paper bag paper for stamp
 coffee
 children--types, children with glass
 children

Games

Looby Loo--right, left, in, out
Turn About--high, low, in, out
The Mulberry Bush--days of the week
The Merry-Go-Round--up, down, around
One Big Circle Marching Go--in, out, down, up
Bluebird--through
Musical Chairs--less
Go In and Out the Windows--up, down
Farmer in the Dell--eight children play
This Old Man--counting
Point Your Little Toe--little
Skip to My Lou--two
Here We Go Around the Mountain Two by Two--two, up
Red Leaves Falling Down--down, over
Oats, Peas, and Beans--middle
Up and Down--up, down
I'm Very, Very Tall--tall, small
Diddle, Diddle Dumpling My Son John--up, down
Snail Game--first, last, nearer, farther
Five Little Chickadees--counting
One Elephant--counting to ten
How Do You Do My Partner?--today
Here We Come Walking Down the Street--today, down
Three Little Maids--three
Little Sally Waters--position
Dance So Merrily--one
As I Was Walking Down the Street--little, down
Ring Toss--number
Knocking at My Door--counting
Block Relay--first, second, third, fourth
Hide and Go Seek--counting
Riddles--comparison

Rhythms
Songs

Chimney and a Star--far, close
 Two Little Blackbirds--two
 Ten Little Indians--counting
 The Pigs--three, big, today, little
 Three Little Drums--counting
 Here's A Ball for Baby--big
 I Saw Three Ships Sailing--three
 Coasting--down
 The Merry Go Round--up, down
 In the Apple Tree--high
 My Pony--slowly
 The Star and the Moon--little, down, big
 The Milkman--early
 Nickel and Dime--nickel and dime
 Sing Bluebird Sing!--four
 Dandelions--first
 Pussy Willow--early
 Twinkle, Twinkle Little Star--up, above, high
 Snowflakes--little
 Hot Cross Buns--one, two
 Birthday Song--counting
 Big, Tall Indian--size
 Wee, Willie Winkie--up, down
 Stairs--up, down
 Rumplekins Are Gay--day, night
 Come Little Leaves--down, one
 Witches--tall, big
 I Haven't A Penny--two, penny, dime
 Elevator Man--up, down, first, second, third, fourth
 O'clock in the Kitchen--little, tall
 The Aeroplane--high, up
 Pretty Bunny--big, long
 Here is Sunshine--high, low
 Robin, Robin sing to Me--high, up
 A Penny for Gandy--penny
 Antedated Numbers--counting
 The Animals of Farmer Jones--size, number, time
 Ants at Work--size, number
 Children Little--counting
 The Story of Collette--number
 There's My Baby--size
 The Night Before Christmas--number
 Little Miss--size
 Mother Goose Tells Time--time
 The Child's Almanac--day, week

Rhythms

Clapping hands and tapping feet--faster, slowly, lighter
High Stepping Horses--big, little
Giant Steps--great, big, little, tall, bigger than
Skipping--faster, slowly, high, low, down
Falling Leaves--high, top, up, middle
Gallop--two by two, before, after
Jumping--number of jumps
Walking--number of steps
Aeroplane--high, low, far, near
Skating--two by two
Seesaw--up, down
Swing--number
Music--counting rhythm
Dance--counting steps and slides
Marching--counting soft and loud steps

Stories

The Three Bears--great, big, bigger than, smaller than, middle
Three Billy Goats Gruff--big, little
Three Little Pigs--big, small, little
Millions of Cats--many
Pokey Little Puppy--down, up, far, close
Bobby Had a Nickel--nickel
I Had a Penny--penny
Make Way for the Ducklings--counting
Cinder--number order
Gingerbread Boy--faster, lighter, nearer
Ping--today, morning, minutes, early, late
The Blue Dishes--penny
The Seven Cats--counting
Jon and Jean are Six--counting
Bobbie and Donnie Were Twins--counting, pairs
A Penny for Candy--penny
Animated Numbers--counting
The Animals of Farmer Jones--size, number, time
Anybody at Home--size, number
Chicken Little--counting
The Story of Collette--number
Where's My Baby?--size
The Night Before Christmas--number
Little Hippo--size
Mother Goose Tells Time--time
The Child's Almanac--day, week

RPA firms

Obtaining funds and supplies faster, allowing
 High Speed High Horse-power little
 Giant Speedy-horse, big little
 Side-by-side, two, four, eight, ten
 Letting leases higher for as many
 Getting two per two before after
 Jumping-number of firms
 Walking-number of steps
 Arobame-high, two, first, next
 Starting two per two
 Seaway-as, four
 Swain-number
 Mack-combined 124 firms
 Denoe-combined sales and long leases
 Meroving-combining soft and long leases

Sports

The fine best--best, big, bigger than smaller firms
 Mackie
 Three fifty goats outfit--big, little
 Three fifty five five--big, little
 Millions of oats--wheat
 Porky piggy piggy down, the last chose
 Porky had a Mexico--Mexico
 I had a family--family
 Wink-wink for the Dogfights--combining
 Gindor-number order
 Gindor-piggy, mountain, mountain, soft
 The Blue Dishes--bunch
 The Seven Cabs--combining
 You and your six six--combining
 Porky and pony were twins--combining, birth
 A bunch for Candy--bunch
 Another batch--combining
 The Amish to internet, horses--size
 Another to home--size, number
 Another to outfit--combining
 The story of outfit--number
 Wines, a big happy--size
 The Wines before same--number
 Little Hippo size
 Motor good size time
 The outfit a fitness--gala, week

The Greedy Pig--counting pennies
 The Restless Robin--number
 The Country Bunny--number
 The Tale of Easter--time
 The Golden Egg--size
 Peter Rabbit--number
 Little Black Sambo--number
 The Little Gardeners--number, time

Poems

Five Little Squirrels }
 Five Little Ducks }
 Five Little Bunnies } first, second, third, fourth, last
 Five Little Mice }
 Five Little Ants }

Here's A Little Ball--little, bigger, big, number
 Here's A Ball for Baby--big
 Tom Thumb--size
 Simple Simon--penny
 When I Was One--counting
 Three Wise Men of Gotham--counting
 Choosing Shoes--counting
 The Cat Counting--counting, up, down, high
 A Neat Little Clock--little, time
 The Tall Clock in the Hall--tall
 The Balloon Man--big, small, high, low
 The Barbers--down, close, top
 Rabbits--up, down
 Trains--number
 Foreign Lands--up, down, higher, farther
 The Swing--up, down
 Twenty Foolish Fairies--number

Seatwork

Stringing beads--number, number order
 Peg boards--quantity, number of pegs
 Blocks--size and position
 Paper--number, size, folding for size
 Cutting or use of scissors--size
 Parquetry--form, size
 Plasticine--form, size

BIBLIOGRAPHY

Bentley, E. Mae, "Working Out Number Opportunities Which Can Be Developed Meaningfully with a Typical Kindergarten Class," Unpublished Master's Thesis, Boston University School of Education, 1938.

Brownell, William A., "Readiness and the Arithmetic Curriculum," Elementary School Journal (January, 1938), 38: 344-354.

Brueckner, Leo J., "Readiness in Arithmetic," Readiness for Learning, Association of Childhood Education, Washington, D.C., 1941.

Buckingham, B. R., "How Much Number Do Children Know?" Educational Research Bulletin (September 11, 1929), 8: 279-284.

Buckingham, B. R., and J. H. MacLatchy, Number Abilities of Children When They Enter Grade One, Report of the Society's Committee on Arithmetic, 29th Yearbook, National Society for the Study of Education, Public School Publishing Company, Bloomington, Illinois, 1930, pp. 473-524.

Burke, Agnes C., "The Evaluation of a Planned Program to Develop Number Concepts in the Kindergarten," Unpublished Master's Thesis, Boston University School of Education, 1947.

Buswell, Guy, and Charles Judd, Summary of Educational Investigations relating to Arithmetic, The University of Chicago, Chicago, Illinois, 1929.

Buswell, Guy, and Leonore John, The Vocabulary of Arithmetic, The University of Chicago, Chicago, Illinois, 1931.

Carper, Doris, "Seeing Numbers as Groups in Primary Grade Arithmetic," Elementary School Journal (November, 1942), 43:160-170.

Child Study Committee of the International Kindergarten Union, A Study of the Vocabulary of Children before Entering the First Grade, Baltimore, 1928.

Connor, William, A Study of the Kindergarten Achievement Testing in Arithmetic, Bureau of Educational Research Bulletin, No. 6, Board of Education, Cleveland (July 29, 1929).

Culkin, Mabel, "The Contemporary Kindergarten," The Educational Record (October, 1943), 24:355.

Dickey, John W., "Readiness for Arithmetic," Elementary School Journal (April, 1940), 40:592-598.

Douglass, H. R., "The Development of Number Concepts in Children of Preschool and Kindergarten Ages," Journal of Experimental Psychology (December, 1925), 8:443-470.

Drummond, Margaret, The Psychology and Teaching of Number, Yonkers-on-Hudson, New York, 1922.

Foster, Josephine, and N. Headley, Education in the Kindergarten, American Book Company, New York, 1936.

Grant, Albert, "An Analysis of the Number Knowledge of First Grade Pupils according to Levels of Intelligence," Journal of Experimental Education (September, 1938), 8:63-66.

Hildreth, Gertrude, "Number Readiness and Progress in Arithmetic," Journal of Experimental Education (September, 1935), 4:1-6.

Hooper, Laura, and Barbara Stratton, "Developing Number Concepts with Young Children," Educational Method (January, 1937), 16:193-198.

Langdon, Grace, Similarities and Differences in Teaching in Nursery School, Kindergarten and First Grade, The John Day Company, New York, 1933.

Lee, J. Murray, and Dorris Lee, The Child and His Curriculum, D. Appleton Century Company, New York, 1940.

MacLatchy, Josephine, "Seeing and Understanding Number," Elementary School Journal (November, 1944), 45:144-152.

Mahoney, Olive, "Extending First Grade Experiences in Number," Unpublished Master's Thesis, Boston University School of Education.

McLaughlin, K. L., "Number Abilities of Pre-School Children," Childhood Education (May, 1935), 11:348-353.

McLaughlin, K., and E. Troxell, Number Projects for Beginners, J. B. Lippincott Company, Philadelphia, 1923.

Chittenden, Mabel, "The Governmental Undersecretary", The Hygiene
Society (October, 1940), 24:83.

Dickens, John W., "Residence for Infirmary", Hygiene Society
Journal (April, 1940), 40:83-88.

Dollfus, H. H., "The Development of Mumpers' Gonorrhea in
Oppression of Press freedom and Undersecretary Area", Journal
of Experimental Pathology (December, 1939), 34:38-40.

Dunsmore, Hartley, "The Pathology and Treatment of Mumpers'
Yonkers-on-Hudson", New York, 1938.

Foster, Josephine, and M. Hesdorff, Hygiene in the Higher
Degrees, American Board of Commissioners, New York, 1938.

Glast, Alfred, "A Mumpers' Analysis of the Mumpers' Knowledge to Mumpers", Journal of Experimental Pathology (September, 1938), 38-42.

Hickey, Gertrude, "Mumpers' Residues and Products in Artery
walls", Journal of Experimental Pathology (September, 1938), 41-8.

Hood, Paul, and Berpala Sivapati, "Development of Mumpers' gon-
ococci with Young children", Hygiene (January
1937), 16:19-18.

Hyde, Grace, Hygiene and Differences in Disease in Tissue and in
Nursery School, Hygiene (March 1938), 15:11-12.

Day Company, New York, 1938.

Lee, J. Murray, and Dorrie Lee, The Child and His Organization,
D. Appleton Century Company, New York, 1940.

Leopold, Gertrude, "Semen and Undersecretary Mumpers",
Hygiene Society Journal (November, 1940), 25:144-145.

Leopold, Gertrude, "Semen and Undersecretary Mumpers",
Undersecretary Society Journal (November, 1940), 25:144-145.

Leopold, Gertrude, "Extending This Disease Experiments to Mumpers'
University master's Thesis", Boston University School of
Hygiene, 1940.

Leopold, Gertrude, "Mumpers' Ability to Live-Sapoid Chyliferous",
Morgan Hill, N. J., "Mumpers' Ability to Live-Sapoid Chyliferous",
Childhood Hygiene (May, 1938), 17:348-352.

L. B. Pippinoff Company, Hygiene for Infirmary
and H. T. Toxoff, Hygiene for Infirmary, 1938.

McMurray, Frank, "What is the Matter with Arithmetic?" Education (April, 1934), p. 451.

Miller, M., and M. B. Wilson, "Integration of Kindergarten and First Grade Work," Childhood Education (October, 1933), 10:33-37.

Mott, Sina, "Number Concepts of Small Children," The Mathematics Teacher (November, 1945), 38:291-301.

Noon, P. G., "Child's Use of Numbers," Journal of Educational Psychology (November, 1919), 1:462-467.

Overman, James, Principles and Methods of Teaching Arithmetic, Lyons and Carnahan, Chicago, 1925.

Parker, Samuel, and Alice Temple, Unified Kindergarten and First Grade Teaching, Ginn and Company, Boston, 1925.

Ray, Ethel, "Arithmetic Readiness in Kindergarten and the Primary Grades," Unpublished Master's Thesis, Boston University School of Education, 1938.

Reid, Florence, "Incidental Number Situations in the First Grade," Journal of Educational Research (September, 1936), 30:36-43.

Riess, Anita, "An Analysis of Children's Number Responses," Harvard Educational Review (March, 1943), 13:149-162.

_____, "The Meaning of the Meaningful Teaching of Arithmetic," Elementary School Journal (September, 1944), 45:23-32.

Russell, Ned, "Arithmetical Concepts of Children," Journal of Educational Research (May, 1936), 29:647-663.

Smith, Nila B., "An Investigation of the Uses of Arithmetic in the Out-of-School Life of First Grade Children," Elementary School Journal (April, 1924), 24:621-626.

Stotlar, Carolyn, "Arithmetic Concepts of Pre-school Children," Elementary School Journal (February, 1946), 46:342-345.

Sueltz, Ben, "Arithmetic Readiness and Curriculum Construction," The Mathematics Teacher (October, 1937), 30:270-275.

_____, "Recent Trends in Arithmetic," The Mathematics Teacher (October, 1940), 33:270-275.

Updegraff, Ruth, Practice in Preschool Education, McGraw-Hill Book Company, Inc., New York, 1938.

Washburne, Carleton W., "Functional Arithmetic," Educational Digest (March, 1937), 2:26-27.

_____, "The Grade Placement of Arithmetic Topics," Twenty-ninth Yearbook of the National Society for the Study of Education, Public School Publishing Company, Bloomington, Illinois, 1930, pp. 641-670.

Wesley, M. J., "Social Arithmetic in the Early Grades," Childhood Education (May, 1930), 11:367-370.

Wilson, Guy M., "Can Life Replace School Appeals?" Education (February, 1937), 47:325-334.

_____, What Arithmetic Shall We Teach? Houghton Mifflin Company, Boston, 1926.

_____, "New Standards in Arithmetic," Journal of Educational Research (December, 1930), 23:286-290.

Woody, Clifford, "The Arithmetic Background of Young Children," Journal of Educational Research (October, 1931), 24:188-201.

Urgent, high priority message to Headquarters, HQMCWPA
HILL, Paul G. (Paul), Inc., New York, 1938.

Massachusetts, Grafton W., "Transitional Arrangement
Disease (Malaria, 1937), S:SE-SA.

"The first place to arrive" The first place to arrive
to those, "Twenty-nine National Health Society
for the first to start to develop rapid
Gombava, communication, 1930, pp. 641-640.

"Society, M. M. "Society Arrangement
Diphtheria (Malaria, 1930), II:393-370.

"Malaria, Dr. W. "One little page before
Diagnosis (Tuberculosis, 1937), IV:358-354.

What Arrangement Grafton New York
Malaria Gombava, Boston, 1938.

to "New standards at Arrangement
Hydrogenated Reservoir (December, 1930), S:SE-SE.

Wood, Gifford, "The arrangement made to young child
year, " Journal of Postgraduate Research (October, 1931)
S:TE-SE-SE.



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